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PHYSIOLOGY.<sup>1</sup>

LOCALIZATION OF FUNCTION IN THE BRAIN.—The question at present of most fundamental interest in the physiology of the brain is, whether the various functions of the mind are delegated to special nervous centers of the cerebral cortex; in other words, is or is there not, localization of function in the brain. It is admitted by all physiologists that ordinary involuntary actions, like those of respiration, deglutition, &c., are aroused by impulses proceeding from pretty definitely localized nervous centers; but it has been a question of serious dispute as to whether psychical functions are likewise anatomically distributed over the nerve-cell—containing cortex of the cerebrum. Dr. Ferrier, of London, and Professor Goltz, of Strassburg, have been the chief exponents of the two extreme views on the subject. The former, in accordance with the results of numerous experiments upon monkeys, has mapped out the surface of the brain into numerous areas, each of which was supposed to be the seat of origin of voluntary motor impulses for a definite group of muscles, or, it might be, the place where certain special sensations were elaborated. Extirpation of that area would annihilate that function, and stimulation of it would call the function into play. The principal objection to Ferrier's experiments, that his animals were not allowed to live long enough after the operation to give fair chance of recovery from the effects of the shock, has been set aside in the case to be considered, that of a monkey which was killed and submitted to post-mortem examination after having lived in health for seven months succeeding an operation on the left side of the brain. Professor Goltz, working on dogs, has come to widely different conclusions from those of Dr. Ferrier. Goltz finds, in general, that destruction of any part of the cerebral cortex would cause the same paralysis or loss of sensation as that of any other part, in cases where the effect was positive. If the lesion were not too extensive, perfect recovery was gradually attained. But by destroying more and more of the cortex on both sides of the brain, partial paralysis of voluntary motion and loss of sensibility were diffused further over the body and became intensified, and, to some extent, permanent. At the same time the purely psychical powers lost their acuteness until, when nearly the whole of the cerebral cortex was removed, the result was almost total annihilation of the powers of judgment and perception. According to Goltz, the sole function of the cerebrum is to serve as the seat of the purely psychical powers, and any loss of sensation or of motion, which may result from injury to it, are the indirect effects of enfeebled perception. Goltz attributes the definite paralyzes and losses of sensation, obtained by Ferrier, to direct inhibition of these functions due to inhibitory influences proceeding from the injured parts.

<sup>1</sup> This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

At the meeting of the International Medical Congress, held in London, in 1881, Goltz exhibited a dog, and Drs. Ferrier and Yeo a monkey, both of which animals had months previously been subjected to cerebral operations, and had long been in complete health. After a study of animals by members of the Congress, a committee was appointed, consisting of Mr. Langley, Dr. Klein, and Professor Schäfer, to make anatomical and microscopical examinations of the two brains. The committee has recently presented an exhaustive report on the subject submitted to it.

The dog, when still alive, when let loose in a room, wandered with wagging tail, hither and thither, carefully avoiding obstacles and using his muscles in a perfectly normal manner, with the exception of an occasional slipping of the feet upon the floor, and rather general clumsiness of movement. It was clear that the animal possessed the senses of hearing, sight and touch; but the perceptions usually aroused by these sensations were absent. Thus threatening with the voice or a whip produced no sign of fear. A lighted candle brought suddenly close to the dog's eye was noticed only by an indifferent blink. A patch of sunshine or some bright substance on the floor was carefully avoided as if it had been a solid object.

To use now the words of the report: "Professor Ferrier, London, called attention to the condition of the monkey which he had alluded to in his remarks at the morning meeting; the motor area of the left hemisphere had been extensively destroyed seven months previously. The animal was in every other respect sound, except as to the movements of the right arm and leg. The condition of these was recognized as bearing the closest resemblance to hemiplegia of some duration in man—M. Charcot remarking: 'it is a patient'! The movements of the leg were seen to be greatly impaired, and the arm quite powerless, being maintained flexed at the elbow, the thumb bent on the palm, and the fingers semi-flexed. The animal took pieces of food offered it with its left hand, and neither in its struggles to get free, nor on any occasion whatever, did it show any volitional action with its right hand or arm." One of the chief difficulties in the way of the committee which made the post-mortem examination of the two brains, was to determine the homologies of the various parts of the organs. This could not be done with certainty. The destruction of the dog's cerebrum was somewhat more extensive on the right side than on the left. There appears to have been complete and deeply extended destruction of about three-fourths of the substance of the cerebrum; the parts of the cortex remaining intact included the anterior fourth, the superior and inferior median-lateral portions. Most of the so-called "motor" areas appear to have been included in the lesion.

In the monkey it was found that the greater part of the two central convolutions, together with adjacent parts of the frontal

and parietal lobes, had been removed on the left side of the brain. Secondary disturbances in the body of the organ had probably made the lesion physiologically more extensive than appeared from the surface. The pyramidal tract of fibers in the spinal cord, which is in connection with the cerebrum, was found to be degenerated throughout its whole extent.

To a disinterested person it seems, from the evidence here offered, that Goltz has shown conclusively the absence of localization of function, as that term is commonly understood, for the brain of the dog, while Ferrier has failed to completely establish his theory of localization of function for the brain of the monkey. —*Four. of Physiology*, Vol. IV, Nos. 4 and 5.

WRITING WITH THE VOICE.—At a meeting of the College of Physicians, last week, Professor Harrison Allen, of Philadelphia, showed a new and very interesting discovery by which spoken language can be represented by a series of curved lines on a receiving surface composed of white paper coated with soot (Ludwig's lymographion). The experiments, which were originated by Professor Allen, from observations which he had made through watching the movements of the soft palate when conducting experiments connected with the human throat, are made with an instrument designed by the professor, and which is very simple and easy of operating. By means of his device he is enabled to register upon the surface of the sooted paper the lines and curves that represent the various phonetic sounds of the human voice. His observations have proved that the discovery will undoubtedly be of great importance in diagnosing cases of diseases of the palate, and in studying the causes of stammering.

Professor Allen has already shown, by means of his interesting experiments, that many of the sounds which have long been considered by elocutionists to be formed by the direct action of the lips, the teeth, or the tongue, are in reality formed primarily by the action of the palate. The subject is sure to prove one of much importance to the world of science, and the professor thinks it will develop some most interesting facts. Dr. Allen calls his instrument the palate-myo-graph.

### PSYCHOLOGY.

GREGARIOUS AND SLAVISH INSTINCTS.—In his very readable "Inquiries into Human Faculty and its Development," Mr. Galton discusses what he regards as a curious and apparently anomalous group of base moral instincts and intellectual deficiencies that are innate rather than acquired. His method is to trace their analogies among the brutes, and to examine the conditions through which they have been evolved. His argument is, that gregarious brute animals possess a marked want of self-reliance,